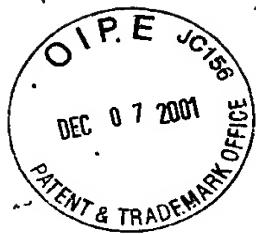# COMPUTER COMPONENT PROTECTION

BACKGROUND OF THE INVENTION

5   The present invention relates generally to a computer device. More particularly, the present invention relates to arrangements for protecting key components of the computing device.

Portable computers generally consist of a lid for carrying a display screen and
10   a base for carrying various internal and external components used for operating the portable computer. By way of example, the internal components may be a hard drive, a modem, a processor, a disk drive, memory and the like, and the external components may be a keyboard, a track pad, buttons and the like.

15   In recent years, sensitive components, such as CD/DVD drives and LCD displays, have been incorporated into the portable computer. By sensitive, it is meant that the CD/DVD drives and LCD displays are some of the most fragile components of the portable computer in terms of sensitivity to impact. The CD/DVD drive generally includes drive components for reading a compact disc (CD) and/or a digital
20   video disc (DVD) and transport components for inserting and removing the CD and DVD discs to and from the drive components. By way of example, the drive components may include a laser, light sensing diode, and a spindle motor, and the transport components may include a movable tray. The LCD display, on the other hand, uses glass substrates with transparent electrodes and a liquid crystal material
25   placed in a gap between the electrodes. The LCD also uses sophisticated driving circuitry (e.g., integrated circuit) for energizing selected segments of the LCD to create the desired image.

Unfortunately, the manner in which the LCD and CD/DVD drive are mounted
30   offers little protection against damage, as for example, damage that is due to dropping or other day-to-day handling of the portable computer. Each of these components is rigidly mounted in the base or lid and thus they are susceptible to damage when the portable computer, and more particularly the base and lid, feels an impact.

Conventionally, the LCD display and the CD/DVD drive have been rigidly mounted to a structural component of the lid and base, respectively, via a fastener such as a screw or bolt. As such, when a portable computer is dropped, the force of impact is typically transferred from the base to the CD/DVD drive and from the lid to the LCD display through the fastening device. Further, as portable computers become smaller, their associated compact structures have even less damage prevention capability. That is, the fragile LCD and CD/DVD drive are more vulnerable to damage as the size of the computer decreases.

Other sensitive components have included a hard drive. In most cases, the hard drive is mounted in the portable computer using similar techniques as those given above with regards to the LCD and CD/DVD drive. However, in some portable computers, the hard drive is mounted using a shock mounting system that reduces shocks thereto. By way of example, the shock mounting system may include a rubberized grommet and bolt that cooperate to couple the hard drive to a metal bracket attached to the housing of the portable computer. The grommet is typically disposed within an opening in the metal bracket and the bolt is typically disposed within an opening in the grommet while being attached to the hard drive.

The CD/DVD drive also includes an enclosure for housing the drive and transport components. The enclosure is typically arranged to structurally support the components, to shield electronic and laser emissions therein, and to prevent dust particles from reaching the drive components. In most cases, the CD/DVD drive, including its own enclosure, is installed into the base of the portable computer. By way of example, the enclosure may be permanently installed in the base via a fastener, or removably installed in the base via a mating structure built into the base.

Unfortunately, the technique of installing the CD/DVD enclosure into the base leads to redundant features. That is, the drive components are disposed inside a double box, i.e., an enclosure inside an enclosure, and therefore they have double features that serve the same purpose, as for example, structural support, shielding, dust protection, and the like. While double protection may sound good, the double box tends to add unnecessary mass, volume, and expense to the portable computer.

These are undesirable traits that go against the current trend to make the portable computer cheaper, thinner and lighter. The extra layer of material may also inhibit the dissipation of heat from the drive components, which can be a major source of heat in the portable computer. As should be appreciated, too much heat can lead to failures in

5   the operation of the CD/DVD drive.

As is generally well known, the CD/DVD drive is not the only source of heat inside the base. Processor chips and other electronic components of the personal computers also generate significant amounts of heat in operation. Advances in

10   processor speed and bus throughput have further compounded this problem. As such, the portable computer generally includes a system for transferring heat away from these various chips and electronic components. By way of example, a fan may be provided to thermally manage the internal components by forcing air through the base. Individual components, such as the processor chip, can also have a heat sink

15   attached thereto for dissipating heat generated by the component. A heat sink is generally made of metal and includes a plurality of outward-extending fins. The metal fins are generally configured to remove heat from the processor chip by means of conduction, convection and radiation. In some cases, the processor chip may be cooled by a fan and heat sink combination.

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While fans and heat sinks provide effective mechanisms for thermally managing many types of computer systems, the fan typically generates undesirable noise and requires an undesirable amount of power. Excess amounts of noise generally lead to user dissatisfaction, and excess amounts of power unduly draw upon

25   the batteries of a portable computer making it unattractive for long periods of battery-operated use. As should be appreciated, larger fans that provide the greatest amount of cooling tend to produce a greater amount of noise, and use a greater amount of power.

30   In many instances it would be desirable to provide portable computers that are cost effective, thinner, lighter, stronger and aesthetically more pleasing than current portable computers. It would also be desirable to provide impact shock protection for sensitive components such as CD/DVD drives and/or LCD displays and a thermal management system that is superior to conventional fans and heat sinks.